DEPARTMENT OF PHYSICS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	I Semester-B.Tech. Computer Science and Engineering -B		
Course Title	Physics-I		
Course Code	PH-IR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIl		
Session	July 2018	Section (if, applicable)	A / B
Name of Faculty	Dr.R.Nagalakshmi	Department	Physics
Email	nagalakshmi@nitt.edu	Telephone No.	0431-2503615
Name of Course Coordinator(s) (if, applicable)	Dr. N.V. Giridharan Dr. S. Manivannan		
E-mail	ksmani@nitt.edu giri@nitt.edu	Telephone No.	0431-2503616 0431-2503612
Course Type	√ Core course	☐ Elective course	

Syllabus (approved in BoS)

I B.Tech Physics Syllabus (June 2018 onwards) PHIR11- PHYSICS I (Common to all branches)

Objectives : To introduce the notions of light matter interaction, fabrication of lasers, light propagation in waveguides, applications of lasers and optical fibers.

To understand the fundamentals of acoustics, crystal physics and structure determination of crystals. To learn the fundamentals of magnetic, electrical and superconducting materials.

To introduce the thoughts of special theory of relativity.

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Lasers Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – laser systems: Ruby laser, He-Ne Laser, semiconductor laser-applications- Holography.

Fiber Optics Fermat's principle and Snell's law-optical fiber – principle and construction – acceptance cone - numerical aperture – V-Number - types of fibers, Fabrication: Double Crucible Technique- fiber optic communication principle – fiber optic sensors.

Acoustics: Introduction -reverberation – reverberation time – Sabine's formula – acoustics of buildings – ultrasonics – production of ultrasonics using piezoelectric method –magnetostriction method- applications.

Crystallography: Seven crystal systems and Bravais lattices– Miller indices – interplanar distance- symmetry operation -Bragg's law of X-ray diffraction –Laue Method- powder crystal method- structure determination for cubic system.

Magnetic materials, conductors and superconductors Magnetic materials: Definition of terms – classification of magnetic materials and properties – domain theory of ferromagnetism- hard and soft magnetic materials – applications. Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity
Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory (qualitative) – high temperature superconductors – Josephson effects applications.

Special theory of relativity Lorentz transformation -Time dilation – length contraction- mass-energy relation.

<u>Outcome:</u> Students will be able to know principle, construction of lasers, light propagation in optical fibers and their applications. Students will understand the acoustics of building, ultrasonics, crystal systems and structure determination. Students will also appreciate various materials properties like electrical, magnetic and superconducting. Students will also establish mass-energy relationship through special theory of relativity.

COURSE OBJECTIVES

- To make a bridge between the Physics in school and Graduate engineering courses.
- To introduce the basic concepts of modern optics like Laser, engineering applications of acoustics, fundamentals of crystal physics and materials science.
- To present the basic concepts of special theory of relativity**.**

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
The student will be able to 1. understand the recent technological development based on lasers and fiber optics in various fields. 2. realize as an engineer, the architectural acoustics of buildings 3. study the crystal structure of materials 4.recognize various types of material properties and related properties used in engineering applications. 5. appreciate special theory of relativity	➢ Obtain indepth knowledge on important Physics concepts ➢ Carry out independent research work in interdisciplinary areas ➢ Interact with professionals in related areas Communicate ideas and learn new technologies

COURSE PLAN – PART II			
COURSE OVERVIEW			
• This course is offered in the first semester to all the branches of undergraduate engineering students. Theory – 2 Credits and 1 Credit for Lab			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	Aug 3rd –Sep 1st week	Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions	PPT/ Chalk & Talk
		Einstein's coefficients – population inversion and lasing action, Ruby laser, He-Ne Laser	
		Semiconductor laser applications:–Holography- industrial and medical applications.	
2	Sep 2nd - Oct 2nd week	Fiber Optics Fermat's principle and Snell's law-optical fiber – principle and construction	PPT/ Chalk & Talk
		Acceptance cone - numerical aperture - V-Number, types of fibers, Fabrication: Double Crucible Technique,	
		Fiber optic communication principle – fiber optic sensors-other applications of optical fibers.	
		Reverberation – reverberation time – Sabine's formula – Acoustics of buildings	
		Ultrasonics – production of ultrasonics using piezoelectric method –magnetostriction method- applications.	
3	Oct 3rd – 4th week	Crystallography - Crystalline and amorphous solids – lattice and unit cell – seven crystal system and Bravais lattices – symmetry operation	PPT/ Chalk & Talk
		Miller indices – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc – Bragg's law of X-ray diffraction – Laue Method, powder crystal method.	

4	Nov 1st - 4th week	Magnetic materials, conductors and superconductors Magnetic materials: Definition of terms – classification of magnetic materials and properties – Domain theory of ferromagnetism	PPT/ Chalk & Talk
		Hard and soft magnetic materials – applications. Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity	
		Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory (qualitative)	
		High temperature superconductors – Josephson effect – quantum interference (qualitative) – SQUID – applications.	
		Magnetic materials, conductors and superconductors Magnetic materials: Definition of terms – classification of magnetic materials and properties – Domain theory of ferromagnetism	
5	Nov 5th week	Special theory of relativity Lorentz transformation -Time dilation – length contraction- mass-energy relation	Chalk & Talk
6	Dec 1st week	Re-assessment	
7	Aug 3rd week	Lab Demonstration	Hands on training sessions
8	Aug 4th week	Lab Demonstration	Hands on training sessions

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Test -I	2nd week of September	60 min	20 %
2.	Test – II	2nd week of October	60 min	20 %
3.	Quiz	2nd week of November	30 min	10%

4.	Compensation Assessment	1st Week of December	60 min	Appropriate weitage will be calculated
5.	Semester exam	2nd week of December	180 min	50 %
	Theory Total Weightage			100%
6	**Practicals**	**List of Experiments**	**Duration**	**Weightage**
1.	Aug 5th week	Torsional pendulum	180 min	20%
2.	Sep 1st week	Convesion of Galvanometer into Ammeter	180 min	20%
3.	Sep 2nd week	Dispersive power - spectrometer	180 min	20%
4.	Sep 3rd week	Newton's rings	180 min	20%
5.	Sep 4th week	Numerical aperture of an optical fiber	180 min	20%
6.	Repeat lab Sep 4th week			
7.	**Total Practical**			100%
8.	**Lab Assessment :** After Demonstration classes , individual lab classes are assessed giving equal weightage and hence no separate semester exam for laboratory **Weightage:** Theory : 2/3 + Lab Practicals : 1/3 **Pass criteria** = Class average/2 or 35% whichever is higher.			

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004)
2. An Introduction to Fiber Optics, Ajoy Ghatak and K. Thyagarajan, Cambridge Press (1998)
3. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).
4. Introduction to Solid State Physics,7th Edn, Charles Kittel, Wiley Publishers (2004)
5. A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).
6. Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010)

Company, New Delhi (2009).

5. Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

The teachers can be contacted through phone or in person for clarifications by the student on a mutually convenient time or through e-mail: nagalakshmi@nitt.edu or phone 9443940384

COMPENSATION ASSESSMENT POLICY

One compensatory examination will be conducted during the first week of December. The portions for the test: Topics covered until 2nd week of November.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

The course teacher is available for discussion and clarification during their free times.

FOR APPROVAL

R. Nagalak

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____

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Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered. Details of compensation assessment to be specified by faculty.**

d) The passing minimum shall be as per the regulations.

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.